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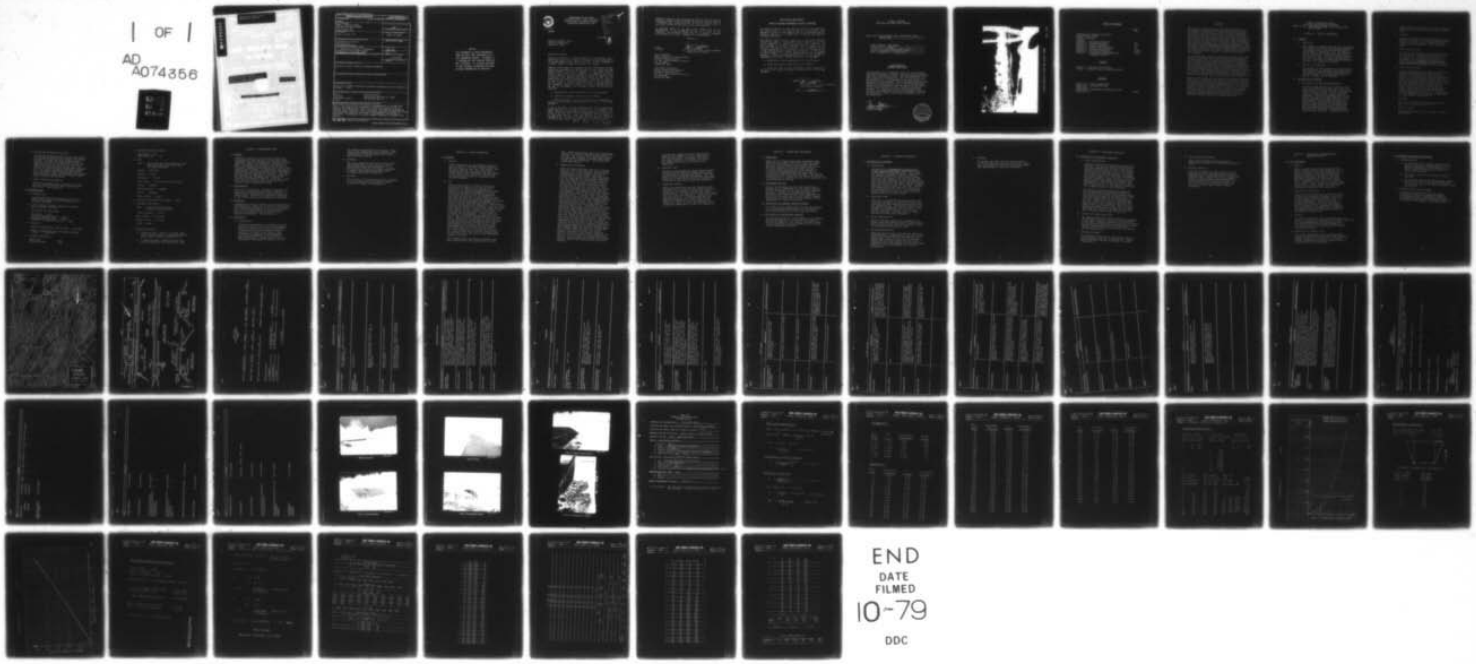

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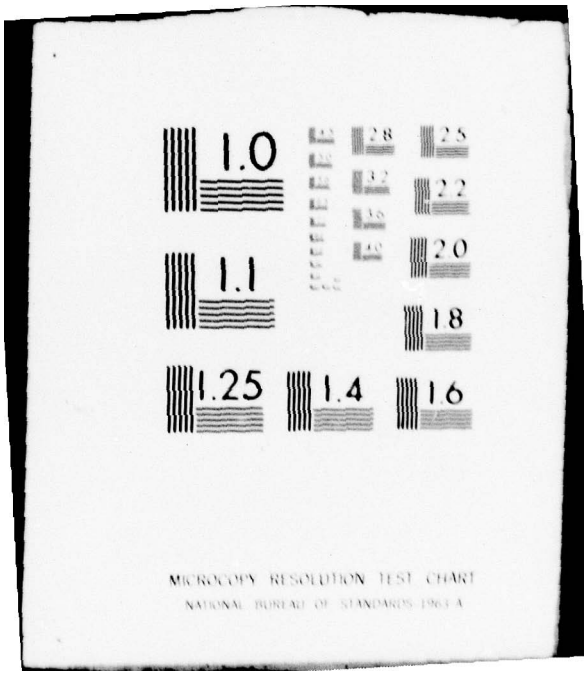
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Lake Wallkill Dam (NJ-00032)
Hudson River Basin, Wallkill River,
Tributary, Sussex County, New Jersey
Phase 1 Inspection Report.

F. Keith /Jolls

Final Rept., (12) DACW61-79-C-0011

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

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3. RECIPIENT'S CATALOG NUMBER	
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9. PERFORMING ORGANIZATION NAME AND ADDRESS: Louis Berger & Associates 100 Halstead St. East Orange, NJ 07019	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
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16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia, 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams
Spillways
Structural analysis
safety
Visual inspection
National Dam Inspection Act report
Lake Wallkill Dam, N.J.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE - 2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO

NAPEN-D

16 SEP 1979

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, NJ 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Lake Wallkill Dam in Sussex County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Lake Wallkill Dam, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in good overall condition. The dam's spillway is considered inadequate since 57 percent of the 100-year flood would overtop the dam. The low hazard potential classification means that in the event of failure of the dam, no loss of life and only minimal economic loss is expected. For this reason, no further studies or increase of spillway capacity are recommended. However, to assure the continued functioning of the dam and its impoundment, the following remedial actions could be undertaken:

a. Remove debris from the spillway box inlet and sluiceways.

b. Reseal the expansion joints in the crest sidewalk.

c. Refill the eroded areas on the downstream slope immediately to the left of the stoplog sluiceway and along the toe of the right embankment.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman James A. Courter of the Thirteenth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

Joel Callahan

JOEL T. CALLAHAN
Lieutenant Colonel, Corps of Engineers
Acting District Engineer

1 Incl
As stated

Copies furnished:
Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

John O'Dowd, Acting Chief
Bureau of Flood Plain Management
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

LAKE WALLKILL DAM (NJ00032)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 7 May 1979 by Louis Berger and Associates, Inc. under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Lake Wallkill Dam, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in good overall condition. The dam's spillway is considered inadequate since 57 percent of the 100-year flood would overtop the dam. The low hazard potential classification means that in the event of failure of the dam, no loss of life and only minimal economic loss is expected. For this reason, no further studies or increase of spillway capacity are recommended. However, to assure the continued functioning of the dam and its impoundment, the following remedial actions could be undertaken:

a. Remove debris from the spillway box inlet and sluiceways.

b. Reseal the expansion joints in the crest sidewalk.

c. Refill the eroded areas on the downstream slope immediately to the left of the stoplog sluiceway and along the toe of the right embankment.

APPROVED: Joel Callahan

JOEL T. CALLAHAN
Lieutenant Colonel, Corps of Engineers
Acting District Engineer

DATE: 13 September 1979

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam Lake Wallkill Dam Fed ID# NJ 00032
NJ ID# 599

State Located New Jersey
County Located Sussex
Coordinates Lat 4114.3 - Long. 7432.3
Stream Tributary to Wallkill River
Date of Inspection 7 May 1979

ASSESSMENT OF GENERAL CONDITIONS

Lake Wallkill Dam is assessed to be in a good overall condition although the present spillways can accommodate only 56% of the design flood. The low embankment is of minor structural consideration and in view of its size and position, it is recommended to be downgraded to a low hazard classification. No detrimental findings were observed to merit further study. The following minor repairs are recommended to be undertaken by the owners in the future as part of their regular maintenance program: 1) remove debris from the spillway inlet 2) reseal the expansion joints in the exposed concrete surfaces and 3) refill the eroded embankment areas on the backslopes.

F. Keith Jolls P.E.
Project Manager

OVERVIEW OF LAKE WALLKILL DAM

MAY, 1979

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FIGURES

APPENDIX

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NAME OF DAM: LAKE WALLKILL DAM FED # NJ00032 AND
NJ ID # 599

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with Contract FPM-36 between Louis Berger & Associates, Inc. and the State of New Jersey and its Department of Environmental Protection, Division of Water Resources. The State, in turn, is under agreement with the U.S. Army Corps of Engineers, Philadelphia to have this inspection performed.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of the Lake Wallkill Dam and appurtenant structures, and to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The dam at Lake Wallkill is a 490 foot long earth and concrete structure built over an older earth and masonry dam (the original dam was utilized as a core). The 12 foot wide crest is surfaced with a poured concrete boardwalk. The entire upstream face of the dam is protected by sloping pre-cast, reinforced concrete slabs which extend to the lake bottom. The principal spillway is a concrete drop-inlet with a 24" outlet pipe while a gated sluiceway and multiple weir openings function as auxiliary spillways. The auxiliary sluiceway is located 45 feet from the left abutment. Discharge over the

broad crested (12 feet wide) auxiliary spillway flows down a concrete apron into the stilling pond.

b. Location

The dam is situated in Vernon Township on an unnamed tributary 1.2 miles east of the Wallkill River on the west side of Pochuck Mountain, about 4.1 miles northeast of the Borough of Sussex.

c. Size Classification

The dam at Lake Wallkill has a maximum height of 15 feet and a maximum storage capacity of 215 acre-feet. Accordingly, this dam is in the small size category as defined by the criteria in the Recommended Guidelines for Safety Inspection of Dams (storage less than 1,000 acre-feet and height less than 40 feet).

d. Hazard Classification

The area downstream of the dam is essentially undeveloped woodland and farmland in the Wallkill River floodplain. The downstream channel is relatively straight with steep sided walls for 1,500 feet below the dam where it passes under Lake Wallkill Road. It then enters the flat marshland of the Wallkill River. The only development consists of several farm houses just north of the stream. While a failure might cause some road damage there is little likelihood of extensive residential property damage or loss of life. Accordingly, it is recommended that this dam be downgraded to a low hazard classification.

e. Ownership

This dam is owned by the Lake Wallkill Club Inc., RD 2, Box 600, Sussex, N.J.

f. Purpose of Dam

The purpose of the dam is to create a recreational lake.

g. Design and Construction History

The dam was originally built in the late 1930's but design and construction details are unknown as the inital dam was built without proper permits. In 1968, the Lake Wallkill Club Inc. made application to the State for a permit to repair and raise the level of the dam. The repairs and reconstruction details were designed by Arie J. Zwart, Consulting Engineer, Sparta, N.J. The permit was granted and the dam was reconstructed in 1969, incorporating the original stone and earth structure which formed a foundation core for the new work.

h. Normal Operating Procedures

The dam is maintained and operated by the Lake Club who manage the lake front property and facilities. (See Section 4)

1.3 PERTINENT DATA

a. Drainage Area

Lake Wallkill Dam has a drainage area of 0.8 square miles which consists primarily of undeveloped woodland.

b. Total combined spillway capacity at maximum pool elevation - 900 cfs

c. Elevations (ft. above MSL)

Top of dam - 543.3
Principal spillway crest - 541.0
Auxiliary spillway crest - 541.3
Streambed at centerline of dam - 528±

d. Reservoir

Length of maximum pool (top of dam) - 1,500 feet

Length of recreation pool (principal spillway crest) - 1,480 feet

e. Storage (acre-feet)

Top of dam - 215
Recreation pool - 156

f. Reservoir Surface (acres)

Top of dam - 29
Recreation pool - 26

g. Dam

Type - Earth with reinforced concrete slab face and crest, drop inlet, and auxiliary spillway

Length - 490 feet

Height - 15 feet

Top Width - 12 feet

Side Slopes - U/S 1H:1.5V and D/S 1H:1V

Zoning - Unknown

Impervious Core - Unknown

Cutoff - Unknown

Grout curtain - None

h. Diversion and Regulating Tunnel - None

i. Spillway (Auxiliary)

Type - broad crested pre-cast, reinforced concrete weir

Crest elevation - 541.3

Weir Length - 86.85 feet

Width of weir - 12 feet

Gates - None

j. Regulating Outlets

1) Primary outlet: 4'-0" x 3'2" drop inlet with a 24-inch diameter reinforced concrete outlet pipe at invert elevation 535.5.

2) A gated sluiceway, located 45 feet from the left abutment, 6.6' wide and 8' deep.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Although no details of the original design and construction of the dam built in the 1930's were available, detailed drawings were obtained from the NJDEP which depict the 1968-1969 reconstruction work. In addition to the above, the Bureau of Floodplain Management provided copies of the repair application and permit, the hydrologic and hydraulic calculations, and design considerations discussed between the State and owner's engineer. The design was reviewed and approved by the State engineers who made several recommendations relative to hydrology and hydraulic aspects of the dam. There is no record of their review of the structural aspects of the reconstruction work.

2.2 CONSTRUCTION

There is no information available concerning construction procedures but the field inspection indicates the reconstruction closely follows the design plans. The work was apparently inspected by the design engineer and approved by the NJDEP.

2.3 OPERATION

Communication with the manager of the Lake Association during the inspection revealed the operational and maintenance procedures in force at the present time. Visual observations of the dam and gate operation substantiated the veracity of the described procedures. (See Section 4)

2.4 EVALUATION

a. Availability

Sufficient information is available from the several sources to carry out the assessment. The dam is situated in an area covered with a thin mantle of glacial moraine which is generally less than 10 feet thick. The overburden is composed of unconsolidated, unstratified Wisconsin glacial deposits. HRB classification ranges from A-2 to A-2-4. Immediately underlying the glacial till is

Pre-Cambrian metamorphic Losee gneiss. This dense, hard, banded bedrock is massive structurally while generally exhibiting a well developed joint system.

b. Adequacy

The field inspection and review of the available design plans reveal that the dam is structurally sound and well-built. It is believed that the data available is adequate to render this assessment without need to gather additional information.

c. Validity

The validity of the engineering data available is not challenged and is accepted without recourse to further investigations.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of Lake Wallkill Dam took place on May 7, 1979 with representatives of the Lake Wallkill Club Inc. The overall condition of the dam, its construction and rehabilitation were discussed with the owners. At the time of the inspection, the dam and its appurtenances were in a generally good overall condition.

b. Dam

This dam was rebuilt in 1969 utilizing an earlier earth dam as a core for the reconstruction. In addition to raising and widening the original embankment with crushed stone, the new design included the placing of precast concrete panels on the upstream face and crest as well as the addition of an auxiliary spillway and concrete overflow apron. The crest of the dam, which was widened to 12 feet, forms a concrete broadwalk with benches and a railing located along the back edge. Some surface cracking and differential movement (of up to ½ inch) were noted at several of the paving slabs near the right end of the dam. However, the general overall condition of the concrete and the crest alignment was satisfactory. At the right end of the dam, the embankment is generally less than 5 feet high with a downstream slope of about 1H:1V. Three large trees (10" to 20" diameter) are established on the downstream slope and light erosion was noted near the base of the trees. Some dampness was observed behind the right embankment near the junction of the abutment. The access road to the lake traverses this area and the moisture is reputed to originate as a spring which flows from the opposite side of the road to the low point at the embankment/abutment junction.

Two swimming docks with diving platforms have been constructed on the upstream face of the

dam. These recreational facilities extend some 50 feet out into the lake from the center of the dam. The concrete slope protection behind the auxiliary spillway is uniform and firmly seated into the embankment. All joints are sealed with mastic.

c. Appurtenant Structures

There are three discharge facilities located near the left end of the dam. The principal spillway at the left abutment consists of a timber gated, concrete drop inlet with a 24-inch diameter RCP outlet. With the exception of light spalling and surface cracking, the inlet appears in satisfactory condition. Some minor deterioration was noted at the outlet pipe and headwall including chipping and spalling of the lip of the pipe. The 6.6 feet wide auxiliary sluiceway with timber stoplogs is located about 45 feet from the left abutment. The concrete sidewalls are in satisfactory condition with only light efflorescence noted. It appears that it would be difficult to raise the stop logs during peak flows since they are centrally located beneath the concrete crest slab. The raceway has a bedrock and stone channel which empties into a stilling basin near the headwall of the principal outlet pipe. Some erosion was noted behind the left wingwall of the raceway along with some undercutting and spalling of the crest slab. The right wingwall of the raceway was also slightly undercut at its base (This wall also forms the left side of the adjoining auxiliary spillway overflow apron). The 90 foot long auxiliary spillway section is located immediately to the right of the sluiceway and consists of nine pre-cast concrete, rectangular boxes which function as a broad-crested weir and discharge down the concrete overflow apron. The spillway boxes and apron are in good condition with little deterioration noted. However, some minor cracking was observed, most of the deterioration being located at the joints. Up to 2 inches of differential movement and light seepage was visible at the lower joints. Some of the cracked areas have been patched.

A rectangular timber crib wall extends the width of the embankment on the right side of the overflow apron. A weephole located in the right sidewall of the apron just below the cribwall was dry at the time of the inspection.

d. Reservoir Area

The lake is surrounded by steep, heavily wooded slopes which are basically undeveloped except for the homes around the shorefront. The lake itself is free of debris and appeared clear and quite deep at the dam but there is considerable siltation at some areas around the perimeter.

e. Downstream Channel

Immediately below the dam, the discharge from the lake enters a small stilling basin which is formed by a low masonry concrete wall (with a notched weir). The basin is heavily silted up to the toe of the overflow apron. Downstream of the stilling basin is a second man-made pond and immediately below, the channel descends the side of the mountain in a relatively steep-sided gorge until it enters the Wallkill River floodplain approximately 1,500 feet downstream.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are few formal operational procedures being employed by the owner other than occasional regulation of the discharge at the primary spillway. Since the auxiliary sluiceway stoplogs are set at the same elevation as the auxiliary spillway (3 inches above normal pool), flood control is effectively accomplished without resorting to regulation of the auxiliary sluiceway. The lake is lowered each fall to minimize ice damage and provide an opportunity to inspect and repair, if necessary, the lower portions of the dam.

4.2 MAINTENANCE OF DAM

The dam is maintained by the lake association's manager who is responsible for the repair and preventive maintenance of the dam and other community property. Evidence of an ongoing program of maintenance was observed during the inspection in the form of concrete patches, new stoplog timbers, trimmed grass, fresh paint and the general overall appearance of a well-run facility.

4.3 DESCRIPTION OF WARNING SYSTEM IN EFFECT

No formal warning system exists at the dam although it is continuously monitored by the maintenance staff during periods of heavy flows and storms.

4.4 EVALUATION OF OPERATIONAL ADEQUACY

The present procedures are considered to be adequate and are carried out by a conscientious group of association members. The lack of a warning system is not considered a serious defect due to the lack of major downstream hazards.

SECTION 5 - HYDRAULIC/HYDROLOGY

5.1 EVALUATION OF FEATURES

a. Design Data

Pursuant to the Recommended Guidelines for Safety Inspection of Dams, Lake Wallkill Dam is of small size and low hazard. Accordingly, the 100-year frequency storm was chosen as the design flood by the inspecting engineers. Inflow to the reservoir for the selected 100-year storm was computed utilizing precipitation data from Technical Publication 40 and Technical Memo NWS Hydro 35 by the HEC-1 computer program which gave a peak inflow of 3365 cfs. Routing this storm through the reservoir reduced the peak discharge to 1614 cfs. As the combined spillway capacity is 900 cfs, they can accommodate 56%of the 100-year flood.

b. Experience Data

There are no streamflow records available for this site; moreover, no records have been kept regarding the dams hydraulic performance since its reconstruction. The spillway capacity was designed to accommodate 150% of a 50 yr. storm (based on the South Jersey Curve) with one foot of freeboard. According to the owners, the dam has never been overtopped.

c. Visual Observations

The 24" sluiceway appears to accommodate all normal flows and during periods of heavy storms, the relatively large auxiliary spillways effectively control the reservoir level.

d. Overtopping Potential

Employing the discharge and spillway capacities contained herein, overtopping of several inches would occur in the event of the 100-year frequency storm. However, there are no records or indications that the dam has ever been overtopped nor does there appear to be a significant potential for serious damage as a result of overtopping.

e. Drawdown

To dewater the lake, the stop logs in front of the 24" pipe would have to be removed. Drawdown is possible to elevation 535.5+ and would take approximately 4 days to accomplish.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

No major structural deficiencies were noted at this dam. The precast spillway sections were carefully designed and erected, being bolted together with one inch tie rods. The walkway slab which runs substantially the full length of the crest is in solid condition and shows only minor evidence of differential settlement. This slab appears to rest, in part, on an older concrete slab which capped the earlier dam's masonry walls. The structural height of the embankment sections on each side of the spillway is quite low due to the placing of backfill (for a parking area) on the backslopes.

The concrete slopewall behind the auxiliary precast spillway sections shows evidence of the phreatic line reaching the subgrade support only a few feet below the spillway crest. The available design plans do not indicate what the lower edge of this slab is supported upon as it is outside the limits of the older dam. However, due to the relatively low and infrequent flows over this spillway, there is little evidence of undercutting of the trailing edge. This however, could be a problem area if there were continuous heavy flows in this area.

b. Design and Construction Data

The 1968 reconstruction design plans are developed in sufficient detail to ascertain the soundness of the work. However, there are no plans or details of the earlier construction over which the present dam was constructed nor is there any knowledge of how the older dam was prepared to support the new construction.

c. Operating Records

As delineated in Section 4, the dam has operated satisfactorily since its reconstruction. There are no available records of repairs, or annual inspections.

d. Post Construction Change

There are no records of any major post-construction changes since the 1968 reconstruction.

e. Seismic Stability

This dam is located in Zone 1 and due to its geometry and size, has negligible potential vulnerability to earthquake forces. Experience indicates dams in Zone 1 will have adequate stability under dynamic loading conditions if stable under static loading conditions. It is the opinion of the inspection team that this dam is stable under static loading conditions.

SECTION 7 - ASSESSMENTS/RECOMMENDATIONS/ REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety

Subject to the inherent limitations of the visual inspection procedures stipulated by the Corps of Engineers, the Lake Wallkill Dam appears to be in a good overall condition although the hydraulic capacity of the three spillways is assessed as inadequate, being able to accommodate only 56% of the design flood. However, as the dam is in a good state of structural repair, modest overtopping would appear to do no major damage as no serious detrimental conditions were observed.

b. Adequacy of Information

Except for visual observations and the review of the 1968 reconstruction plans, little information was otherwise available as no data exists regarding the composition of the original embankment. No recent surveys or inspections have been made and performance data is believed to be nonexistent. However, the availability of information is deemed to be adequate in view of the present condition and hazard classification.

c. Urgency

In view of the present level of maintenance, no urgency is attached to implementing further studies and it is recommended that the remedial measures set forth below be taken under advisement in the future as part of the Association's regular maintenance program.

d. Necessity for Further Study

Due to the recommended downgraded low hazard classification and the face that little property damage is likely in the event of a collapse, further investigative studies regarding the dam are believed to be unnecessary.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

a. Recommendations

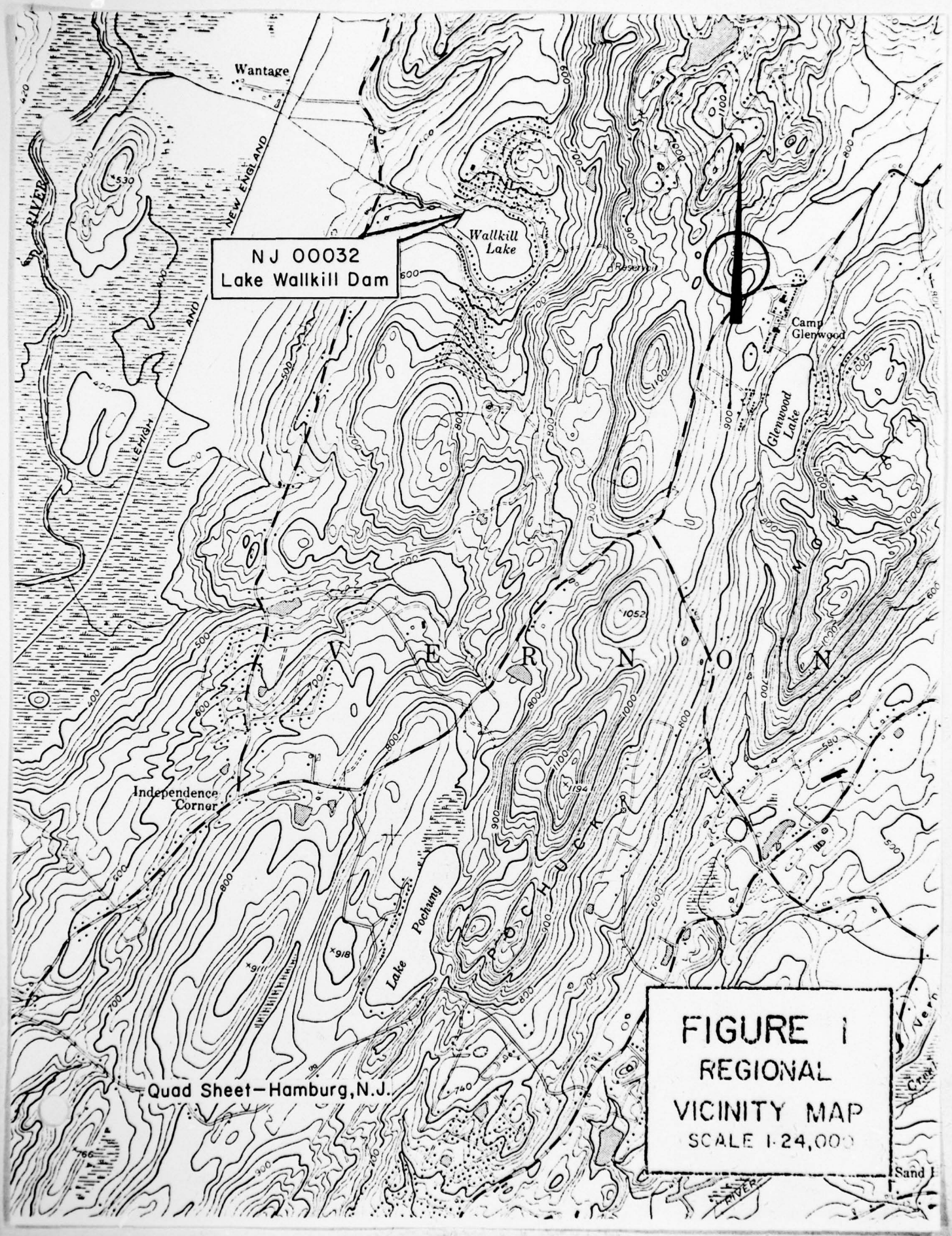
1) On the basis of the present conditions and geometry, hydraulic improvements to the existing spillways are not warranted. All debris should be cleaned out of the box inlet and sluiceways.

2) The joints in the crest sidewalk should be resealed.

3) The sloughed areas on downstream slope immediately to the left of the stoplog sluiceway and along the toe of the right embankment should be refilled.

b. O&M Maintenance and Procedures

No additional procedures other than those presently in effect are warranted except it is recommended that a checklist of periodic maintenance inspections be developed so records of conditions and repairs can be maintained.


NJ 00032
Lake Wallkill Dam
Wantage
Wallkill Lake
Camp Glenwood
Glenwood Lake
Independence Corner
Lake Pochung
Quad Sheet—Hamburg, N.J.
FIGURE 1
REGIONAL
VICINITY MAP
SCALE 1:24,000

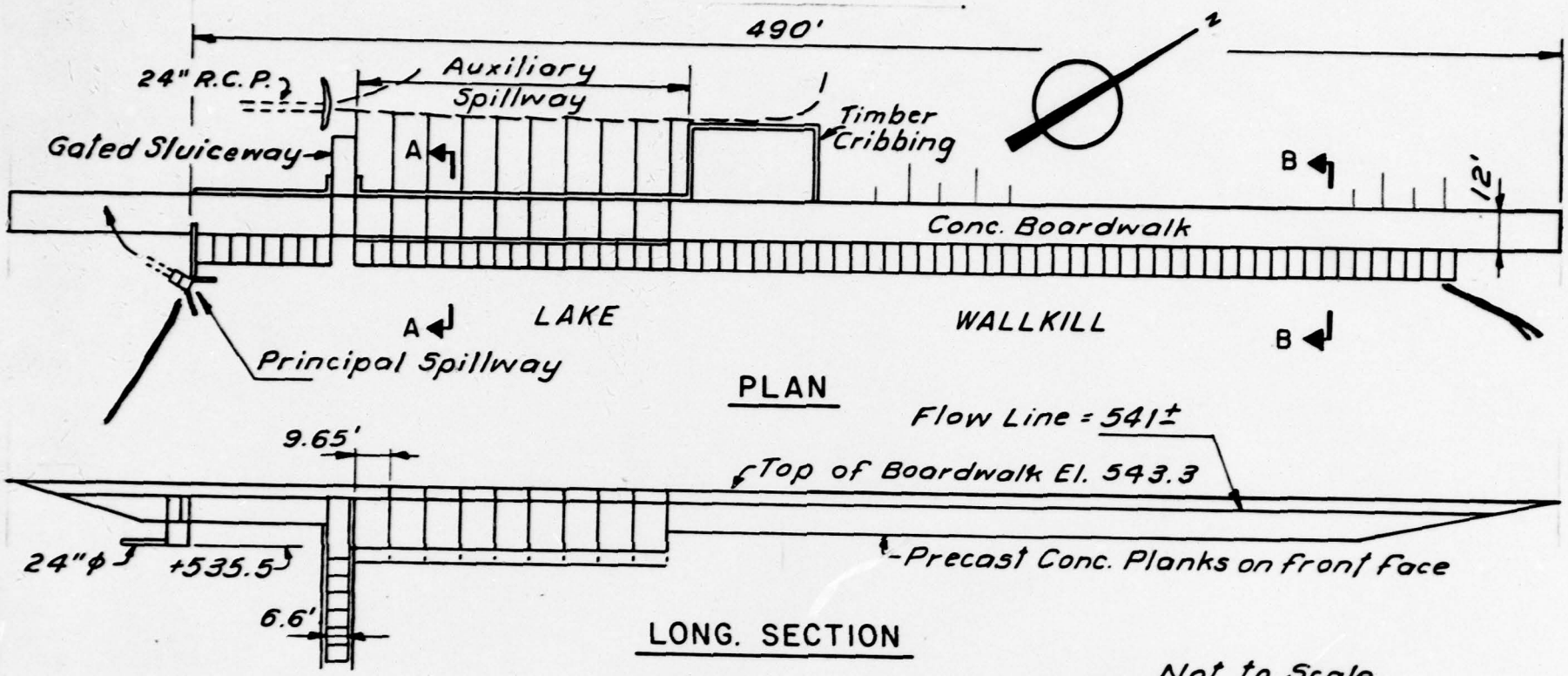

490'
24" R.C.P.
Auxiliary Spillway
Timber Cribbing
Gated Sluiceway
A
B
12'
Conc. Boardwalk
A
LAKE
WALLKILL
B
Principal Spillway
PLAN
Flow Line = 541±
9.65'
Top of Boardwalk El. 543.3
24"ϕ
+535.5
Precast Conc. Planks on front face
6.6'
LONG. SECTION
Not to Scale
Top of B'dw'k El. 543.3
1'-5" Opening
Precast Plank
C.I.P. Slope Wall
Broken Stone
SECTION A-A
Precast Conc. Planking
El. 543.3
Broken Stone
SECTION B-B

FIGURE 2

Check List
Visual Inspection
Phase 1

Name Dam Lake Wallkill County Sussex State New Jersey Coordinators NJDEP

Date(s) Inspection 5/7/79 Weather Clear Temperature 60°

Pool Elevation at Time of Inspection 541 M.S.L. Tailwater at Time of Inspection 528 M.S.L.

Inspection Personnel:

T. Chapter	C. Blumenstock (LWC)	R. Lang
K. Greenfield	C. Jacobs (LWC)	
K. Jolls		

T. Chapter Recorder

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEE PAGE ON LEAKAGE	None observed. Light seepage at joints in overflow apron.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Satisfactory	
DRAINS	Weep hole through right wing wall of emergency overflow weir - Dry at time of inspection.	
WATER PASSAGES	Natural channel heavily silted around stilling basin.	
FOUNDATION	Bedrock appears high - Bedrock outcrops at bottom of raceway and beneath outlet headwall at left abutment.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBERSVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Some surface cracking of 5" thick concrete slab which covers the crest of the embankment. Overflow apron slab exhibits larger cracks. Cracks probably caused by differential settlement or frost heaving. Some cracks already repaired.	Joints should be re-sealed.
STRUCTURAL CRACKING	Retaining wall and wingwalls exhibit light surface deterioration consonant with their age. Piers appear in good shape. Right wingwall of gated sluiceway slightly undercut at toe.	
VERTICAL AND HORIZONTAL ALIGNMENT	Both are satisfactory. Near the right end of the dam, one or two of the crest slabs have open cracks along which minor differential movement (½") has occurred.	
MONOLITH JOINTS	Overall good condition. All joints sealed with mastic which has squeezed up in several places but little differential movement noted on face slabs. Overflow apron exhibits some differential movement up to 2" in places. Top slabs look good.	
CONSTRUCTION JOINTS	Satisfactory	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None visible	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None noted	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Shallow (< 6' high) backslope of right side of dam is very steep (∿ 1:1). Benches and railing along back of crest. Some erosion near base of trees on backslope.	
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	Satisfactory - Concrete top and front slabs appear stable and uniform.	
RIPRAP FAILURES	N/A	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
EXCESSIVE SHRUB, GROWTH, TREES, ETC.	Three large (10"-20" dia.) trees growing just below crest on backslope of the right embankment. Large tree growing near outlet works.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Embankment grades into natural terrain at both abutments. Embankment overlain with concrete crest and face slabs as far as right abutment. Left end of dam contains outlet works and spillway. Light erosion behind left wingwall of gated sluiceway at junction of abutment.	
ANY NOTICEABLE SEEPAGE	Some dampness behind right embankment near abutment. Reputed to be a spring which originates on opposite side of road and follows the road down to a low point behind the abutment. Dam only 3-5' high in this area.	
STAFF GAGE AND RECORDER	None	
DRAINS	One drain or weephole noted in right wall of auxiliary overflow apron. Weephole dry at time of inspection.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Light deterioration of outlet pipe - Chipping and some spalling at the lip of the pipe.	
INTAKE STRUCTURE	Light surface deterioration of concrete.	
OUTLET STRUCTURE	Good condition - Light efflorescence	
OUTLET CHANNEL	Outlet pipe empties directly into large natural stilling basin. Heavy siltation below emergency spillway apron.	Water level in stilling basin regulated with stop logs at notched weir located at downstream end of basin.
EMERGENCY GATE	Stop logs can be pulled manually.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Long concrete emergency overflow weir appears in good shape - No major cracking or spalling noted.	According to community association officers, emergency overflow only utilized once during a flash flood. Height of water over weir was 2". Weir is 86.8 feet long.
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	Spillway apron slabs exhibits some differential movement (up to 2"). Larger displacements patched with concrete. Some spalling along slab joints. Several slabs cracked in varying degrees.	Deterioration of apron slabs probably the result of frost heaving and/or minor settlement of fill following construction.
BRIDGE AND PIERS	Box sides supporting crest slab over auxiliary weir appear in good shape.	Overflow weirs appear to be of a unitized rectangular box construction.

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Not Applicable	Narrow gated sluiceway has stop logs 4" above present water level.
APPROACH CHANNEL	Narrow channel between emergency overflow weir and outlet structure at left abutment.	
DISCHARGE CHANNEL	Bedrock seems to outcrop under left wing wall and protrude into flume. Considerable amount of earth and rocks at bottom of flume (raceway).	Due to steepness of flume and width, obstructions would probably not form serious constriction to flow during flood stage.
BRIDGE AND PIERS	Crest slab limits height of flow over gated sluiceway but emergency overflow begins functioning simultaneously with this weir.	
GATES AND OPERATION EQUIPMENT	Stop logs now set to elevation equal to emergency overflow weir. However stop logs cannot be removed from above due to crest slab.	~~Stop logs should be repositioned~~ In order to remove these stop logs a person would have to enter water and walk on apron under crest. This could not be accomplished safely while water is passing over the weir.

INSTRUMENTATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VISUAL EXAMINATION		
MONUMENTATION/SURVEYS	None observed	
OBSERVATION WELLS	None observed	
WEIRS	None for instrumentation.	
PIEZOMETERS	None observed	
OTHER		

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Lake surrounded by relatively steep, heavily forested slopes with a scattering of homes along the shoreline.	
SEDIMENTATION	Unable to determine bottom condition however water appears deep at the dam while heavy siltation appears to be occurring in the downstream stilling basin.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	A few hundred feet downstream is a concrete wall with a notch weir which contains the stilling pond at the toe of the main dam's spillway. Below the wall the channel enters a second pond also formed by a wall across the channel. The channel passes through 50" culverts under the entrance road twice before reaching the main road.	
SLOPES	Average slope of the channel is about 8% from the dam site until the stream enters the Wallkill River Valley about 2000 feet downstream. Slope is heavily wooded with large boulders and exposed bedrock.	
APPROXIMATE NO. OF HOMES AND POPULATION	No homes appear close enough to the stream valley to be endangered by a flood until the stream enters the Wallkill River Valley flood plain. This is a very large open area below Lake Wallkill Road at the foot of the mountain. Scattered farm houses several hundred feet north of the channel in the Wallkill Valley.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Available - NJDEP - Div. of Water Resources, Bureau of Flood Plain Management, Prospect St., Trenton, N.J.
REGIONAL VICINITY MAP	Available USGS Quadrangle - Hamburg, N.J.
CONSTRUCTION HISTORY	Some details available - NJDEP - DWR - Bur. Fld. Pln. Mgmt.
TYPICAL SECTIONS OF DAM	Available " " " " " "
HYDROLOGIC/HYDRAULIC DATA	Available " " " " " "
OUTLETS - PLAN	Available " " " " " "
- DETAILS	Available " " " " " "
-CONSTRAINTS	Not available " " " " " "
-DISCHARGE RATINGS	Available " " " " " "
RAINFALL/RESERVOIR RECORDS	Not available

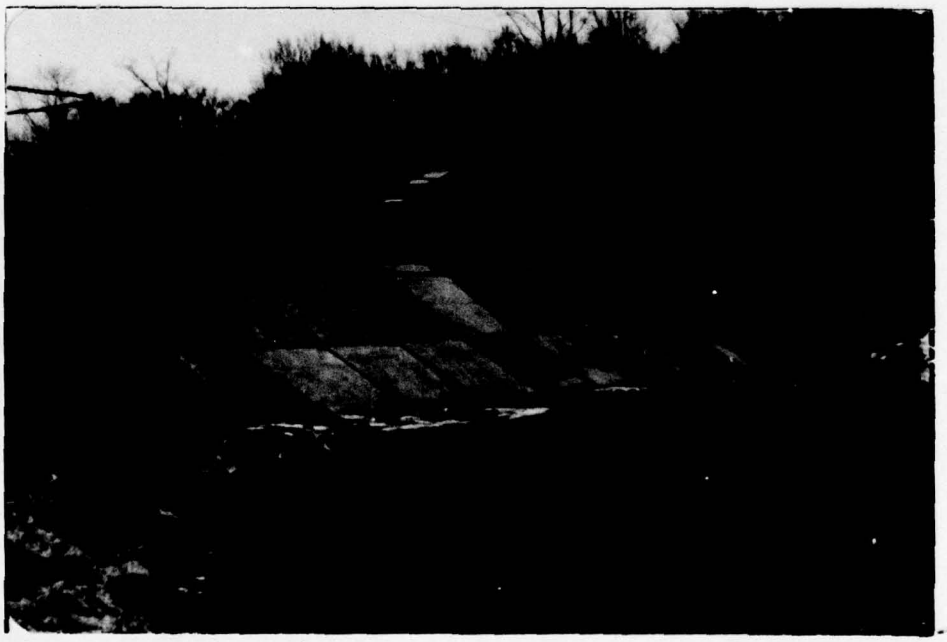
ITEM	REMARKS
SPILLWAY PLAN	Available NJDEP - Div. Water Resources, Bureau Flood Plain Mgmt.
SECTIONS	Available " " " " " " " "
DETAILS	Available " " " " " " " "
OPERATING EQUIPMENT PLANS & DETAILS	Not available

ITEM	REMARKS
DESIGN REPORTS	Not available
GEOLOGY REPORTS	Not available
DESIGN COMPUTATIONS	Not available
HYDROLOGY & HYDRAULICS	" "
DAM STABILITY	" "
SEEPAGE STUDIES	" "
MATERIALS INVESTIGATIONS	Not available
BORING RECORDS	" "
LABORATORY	" "
FIELD	" "
POST-CONSTRUCTION SURVEYS OF DAM	Not available
BORROW SOURCES.	Not available

ITEM	REMARKS
MONITORING SYSTEMS	Not available
MODIFICATIONS	Available - NJDEP - DWR - BFPM
HIGH POOL RECORDS	Not available
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Not available
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Not available " "
MAINTENANCE OPERATION RECORDS	Not available

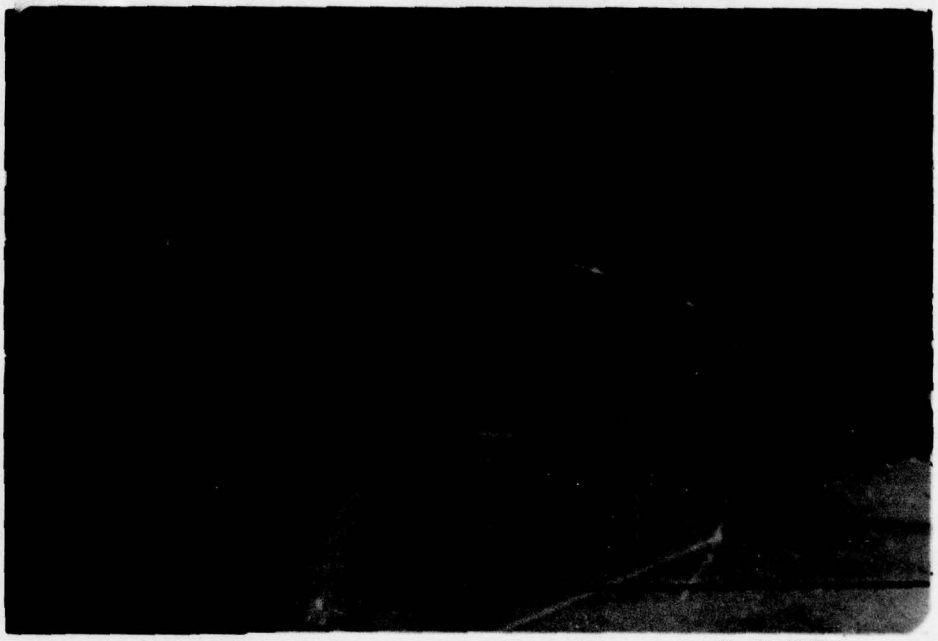
May, 1979

Wallkill Lake Dam



April, 1979

View of Auxiliary Spillway



April, 1979

View of Crest

April, 1979

View of Stilling Basin Outlet

May, 1979

View of Primary Spillway Outlet

May, 1979

View of Sluiceway Outlet Channel

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 0.8 square miles

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 541 (156 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): N/A

ELEVATION MAXIMUM DESIGN POOL: 542.3 (50 yr. storm x 150%)

ELEVATION TOP DAM: 543.3 (215 acre-feet)

CREST: Auxiliary spillway

a. Elevation 541.3
b. Type Concrete broad-crested weir
c. Width 12 feet
d. Length 86.8 feet
e. Location Spillover 48' to 142' from left abutment
f. Number and Type of Gates None

OUTLET WORKS: Drop inlet with RCP outlet pipe

a. Type Concrete box with stop log face
b. Location left abutment
c. Entrance inverts 541
d. Exit inverts 535.5
* e. Emergency draindown facilities Bottom of stop log slot at El. 538+

HYDROMETEOROLOGICAL GAGES: None

a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 900 cfs

* e. continued: 80-inch wide gated sluiceway located 45 feet from left abutment. Invert of sluice at El. 534 +.

BY D.J.M. DATE 6-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A1 OF
CHKD. BY ____ DATE ____ LAKE WALLKILL DAM PROJECT C234
SUBJECT ____

Time of concentration:

length along watercourse to drainage divide = 0.75 miles
= 3960 feet

$\Delta H = 599$ ft. $\therefore$ Slope $= \frac{599 \times 100}{3960} = 15\ \%$

Assume velocity = 5 ft. s^{-1}

$$t_c = \frac{3960}{5 \times 3600} = 0.22 \text{ hours}$$

By California Culverts Method:

$$t_c = \left(\frac{11.9 \times 0.75^3}{599}\right)^{0.385} = 0.16 \text{ hours}$$

Alternative Method:

$$t_c = \frac{3960^{1.15}}{7{,}700 \times 599^{0.38}} = 0.16 \text{ hours}$$

use average $t_c = 0.18$ hours

$$\therefore t_p = \frac{0.083}{2} + 0.6 \times 0.18 = 0.15 \text{ hours}$$

$$Q_p = \frac{484 \times 0.8}{0.15} = 2587 \text{ cfs}$$

Unitgraph:

Time (hours)	T/Tp	Dimensionless Ordinate (DO)	Q (cfs) = Qp × DO
0.083	0.555	0.52	1345
0.167	1.116	0.97	2509
0.250	1.670	0.50	1294
0.333	2.225	0.23	595
0.417	2.786	0.10	259
0.500	3.341	0.045	116
0.583	3.895	0.022	57

Precipitation:

Time (mins)	Precipitation (inches)	Δ (inches)	Rearrange Δ (inches)
5	0.80	0.80	0.02
10	1.28	0.48	0.02
15	1.70	0.42	0.02
20	1.94	0.24	0.02
25	2.17	0.23	0.02
30	2.40	0.23	0.02
35	2.54	0.14	0.02
40	2.67	0.13	0.02
45	2.80	0.13	0.02
50	2.90	0.10	0.02
55	3.00	0.10	0.02
60	3.10	0.10	0.02
65	3.20	0.10	0.03
70	3.30	0.10	0.02
75	3.40	0.10	0.03
80	3.50	0.10	0.03

BY D.J.M. DATE 6-79
CHKD. BY _____ DATE _____
SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

LAKE WALLKILL DAM

SHEET NO. A3 OF
PROJECT C234

Time (mins)	Precipitation (inches)	Δ (inches)	Rearrange Δ (inches)
85	3.60	0.10	0.03
90	3.70	0.10	0.03
95	3.76	0.06	0.03
100	3.81	6.05	0.03
105	3.86	0.05	0.03
110	3.91	0.05	0.04
115	3.96	0.05	0.04
120	4.00	0.04	0.04
125	4.04	0.04	0.05
130	4.08	0.04	0.05
135	4.12	0.04	0.10
140	4.16	0.04	0.10
145	4.19	0.03	0.10
150	4.22	0.03	0.10
155	4.25	0.03	0.10
160	4.28	0.03	0.13
165	4.31	0.03	0.23
170	4.34	0.03	0.24
175	4.37	0.03	0.48
180	4.40	0.03	0.80
185	4.43	0.03	0.42
190	4.46	0.03	0.23
195	4.49	0.03	0.14
200	4.52	0.03	0.13
205	4.55	0.03	0.10
210	4.58	0.03	0.10
215	4.60	0.02	0.10
220	4.62	0.02	0.10
225	4.64	0.02	0.06
230	4.67	0.03	0.05

BY D. J. M. DATE 6-79
CHKD. BY _____ DATE _____
SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.
LAKE WALLKILL DAM

SHEET NO. A4 OF
PROJECT C 234

Time (mins)	Precipitation (inches)	Δ (inches)	Rearrange Δ (inches)
235	4.69	0.02	0.05
240	4.71	0.02	0.04
245	4.74	0.03	0.04
250	4.76	0.02	0.03
255	4.78	0.02	0.03
260	4.80	0.02	0.03
265	4.82	0.02	0.03
270	4.84	0.02	0.03
275	4.86	0.02	0.03
280	4.88	0.02	0.03
285	4.90	0.02	0.02
290	4.92	0.02	0.02
295	4.94	0.02	0.02
300	4.96	0.02	0.03
305	4.98	0.02	0.02
310	5.00	0.02	0.02
315	5.02	0.02	0.02
320	5.04	0.02	0.02
325	5.06	0.02	0.02
330	5.08	0.02	0.02
335	5.10	0.02	0.02
340	5.12	0.02	0.02
345	5.14	0.02	0.02
350	5.16	0.02	0.02
355	5.18	0.02	0.02
360	5.20	0.02	0.02

BY D. J. M. DATE 6-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A5 OF

CHKD. BY ____ DATE ____ LAKE WALLKILL DAM PROJECT C234

SUBJECT Spillway discharge capacity

Spillway discharge :

flow over auxillary spillway as weir $l = 86.85'$

H	C	Q
0		
1	3.0	261
1.5	30	479

auxillary spillway as culvert Area $= 130.3 ft^2$

H	Q
2	739
3	905
4	1,045
5	1,168
6	1,280
7	1,382
8	1,478
* 2.3	792

Sluiceway as weir $L = 6.6'$

H	C	Q
0		
1	3.1	20
1.5	3.1	38

flow through sluiceway as culvert $A = 9.9 ft^2$

H	$c = 0.55$ Q
0	
1	
1.5	
2	62
3	76
4	87
5	98
6	107
7	116
8	124
*2.3	66

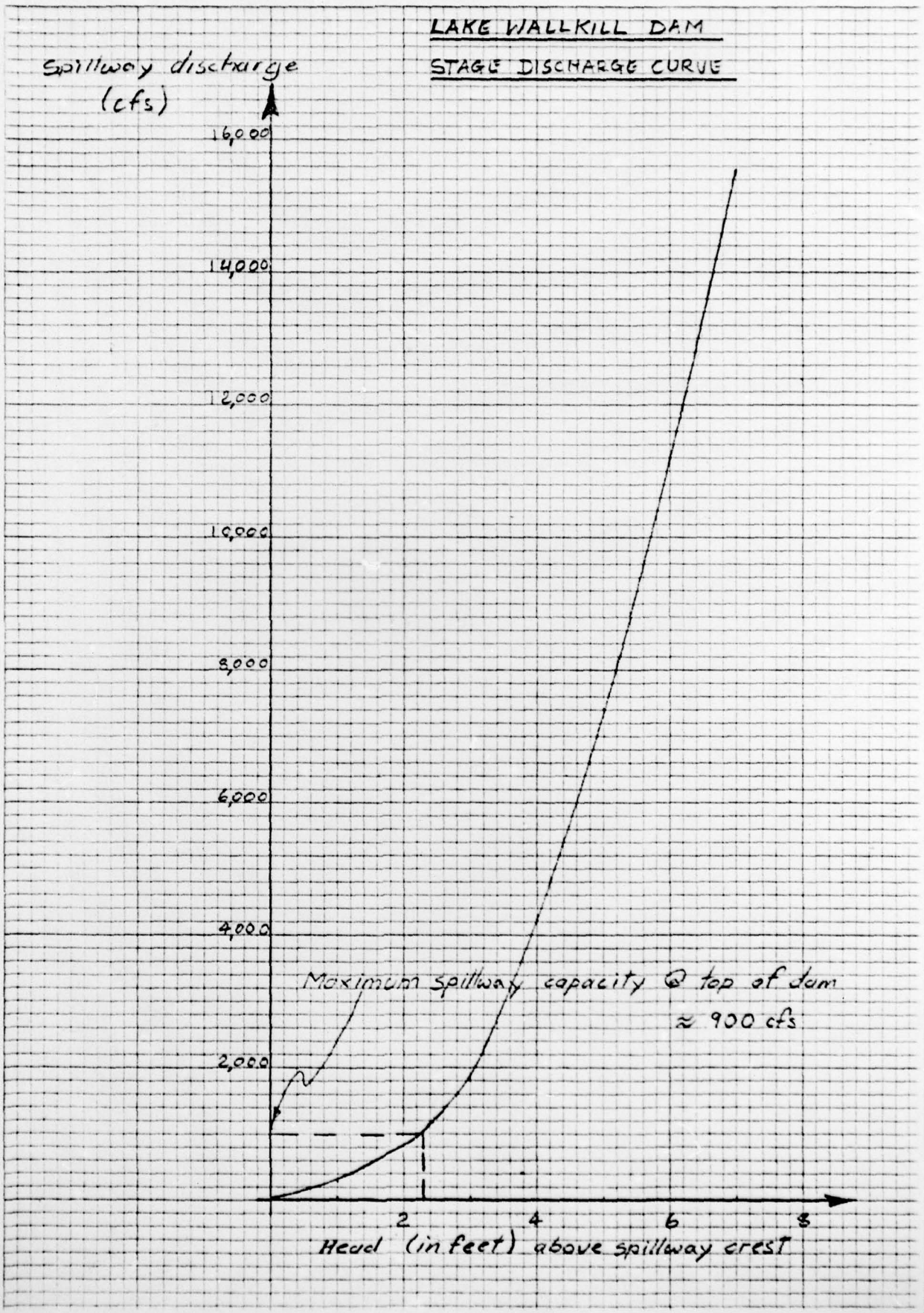
flow through 24" pipe $L = 140'$ $n = 0.012$ $K_e = 0.5$

H	Q
6.5	37
7.5	40
8.5	43
9.5	45
10.5	47
11.5	49
12.5	52
13.5	54
14.5	56
8.8	43

flow over dam $L = 490'$

H	C	Q
0.7	2.8	804
1.7	2.8	3,041
2.7	2.8	6,087
3.7	2.8	9,765
4.7	2.8	13,980
5.7	2.8	18,671
0		

ΣQ (cfs)
0.
318
557
844
1,530
4,220
7,402
11,204
15,532
20,329
901



BY D.J.M. DATE 6-79
CHKD. BY ____ DATE ____
SUBJECT ____

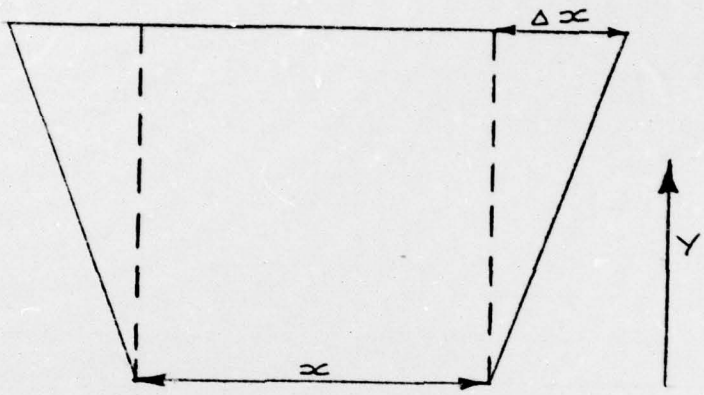
LOUIS BERGER & ASSOCIATES INC.

LAKE WALLKILL DAM

SHEET NO. A7 OF
PROJECT C 234

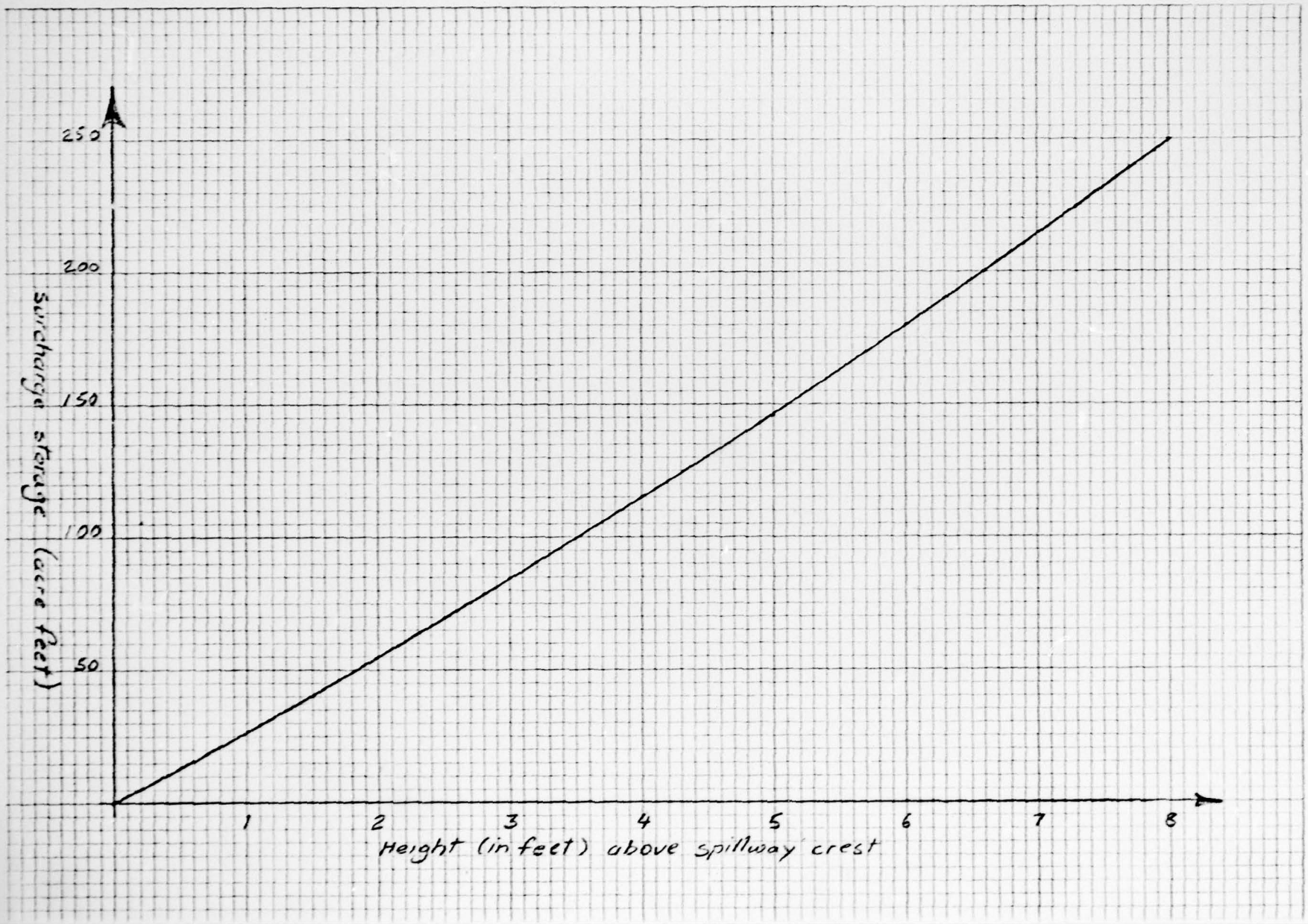
SURCHARGE STORAGE:

Area of lake @ normal pool = 26 acres
Area of lake @ top of dam = 29 acres
Area of ' contour = 51 acres



Increment in volume $\Delta V = (x + \Delta x) Y$

Height in feet above spillway crest.	Surcharge Storage (acre feet)
0	0
1	27
1.5	40
2	55
3	84
4	115
5	146
6	180
7	214
8	250



A8

BY D.J.M. DATE 6-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A9 OF
CHKD. BY ____ DATE ____ LAKE WALLKILL DAM PROJECT C 2.34
SUBJECT ____

GENERAL SUMMARY OF APPENDIX :

length of dam = 490'
length of sluiceway = 6.6'
length of auxillary spillway = 86.85'

Maximum spillway capacity @ top of dam ≈ 900 cfs

Surcharge storage @ top of dam = 59 acre feet
storage @ normal pool = 156 acre feet

∴ Total storage @ top of dam = 215 acre feet

Area of lake @ normal pool = 26 acres
Area of lake @ top of dam = 29 acres

Drainage area = 0.8 square miles

BY D.J.M. DATE 6-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A10 OF

CHKD. BY ..... DATE ..... LAKE WALLKILL DAM PROJECT C234

SUBJECT Approximate drawdown calculations

Storage @ normal pool = 156 acre feet
= 6,795,360 feet^3

Head = 5.5'

Drawdown in 2 stages

i) $H = 4.13'$

$Q = 30$ cfs

$$\text{time} = \frac{6795360}{30 \times 3600 \times 2} \approx 31.5 \text{ hours}$$

ii) $H = 1.38'$

$Q = 17$ cfs

$$\text{time} = \frac{6795360}{17 \times 3600 \times 2} \approx 55.5 \text{ hours}$$

Σ time $\approx (31.5 + 55.5)/24 = 3.6$ days

Say 4 days

Assuming no tailwater and no inflow

BY D.J.M. DATE 6-79

CHKD. BY _____ DATE _____

SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

LAKE WALLKILL DAM

SHEET NO. All OF

PROJECT C-234

LAKE WALLKILL DAM
BY D.J.
JUNE 29 1979

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
100	0	5	0	0	0	0	0	0	0

JOPER	NWT
3	0

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW TO RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	0.80	0.0	0.80	0.0	0.0	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
72	0.0	0.0	0.0

PRECIP PATTERN

0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03
0.03	0.04	0.04	0.04	0.05	0.05	0.10	0.10	0.10	0.10
0.10	0.13	0.23	0.24	0.48	0.80	0.42	0.23	0.14	0.13
0.10	0.10	0.10	0.10	0.06	0.05	0.05	0.04	0.04	0.03
0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02								

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	0.50	0.10	0.0	0.0

GIVEN UNIT GRAPH. NUHGQ= 7

1345.	2509.	1294.	595.	259.	116.	57.

UNIT GRAPH TOTALS 6175. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.0 QRCSN= 0.0 RTIOR= 1.00

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.02	0.00	0.
2	0.02	0.00	0.
3	0.02	0.00	0.
4	0.02	0.00	0.
5	0.02	0.00	0.

6	0.02	0.00	0.
7	0.02	0.00	0.
8	0.02	0.00	0.
9	0.02	0.00	0.
10	0.02	0.00	0.
11	0.02	0.00	0.
12	0.02	0.00	0.
13	0.03	0.00	0.
14	0.02	0.00	0.
15	0.03	0.00	0.
16	0.03	0.00	0.
17	0.03	0.00	0.
18	0.03	0.00	0.
19	0.03	0.00	0.
20	0.03	0.00	0.
21	0.03	0.00	0.
22	0.04	0.03	43.
23	0.04	0.03	122.
24	0.04	0.03	163.
25	0.05	0.04	195.
26	0.05	0.04	229.
27	0.10	0.09	312.
28	0.10	0.09	446.
29	0.10	0.09	513.
30	0.10	0.09	544.
31	0.10	0.09	557.
32	0.13	0.12	604.
33	0.23	0.22	816.
34	0.24	0.23	1119.
35	0.48	0.47	1614.
36	0.80	0.79	2727.
37	0.42	0.41	3365.
38	0.23	0.22	2729.
39	0.14	0.13	1899.
40	0.13	0.12	1299.
41	0.10	0.09	956.
42	0.10	0.09	739.
43	0.10	0.09	628.
44	0.10	0.09	586.
45	0.06	0.05	518.
46	0.05	0.04	400.
47	0.05	0.04	322.
48	0.04	0.03	271.
49	0.04	0.03	230.
50	0.03	0.02	196.
51	0.03	0.02	162.
52	0.03	0.02	146.
53	0.03	0.02	139.
54	0.03	0.02	136.
55	0.03	0.02	134.
56	0.03	0.02	134.
57	0.02	0.01	120.
58	0.02	0.01	95.
59	0.02	0.01	82.
60	0.02	0.01	76.
61	0.02	0.01	74.
62	0.02	0.01	73.
63	0.02	0.01	72.
64	0.02	0.01	72.
65	0.02	0.01	72.
66	0.02	0.01	72.

67	0.02	0.01	72.
68	0.02	0.01	72.
69	0.02	0.01	72.
70	0.02	0.01	72.
71	0.02	0.01	72.
72	0.02	0.01	72.
73	0.0	0.0	56.
74	0.0	0.0	27.
75	0.0	0.0	12.
76	0.0	0.0	5.
77	0.0	0.0	2.
78	0.0	0.0	1.
79	0.0	0.0	0.
80	0.0	0.0	0.
81	0.0	0.0	0.
82	0.0	0.0	0.
83	0.0	0.0	0.
84	0.0	0.0	0.
85	0.0	0.0	0.
86	0.0	0.0	0.
87	0.0	0.0	0.
88	0.0	0.0	0.
89	0.0	0.0	0.
90	0.0	0.0	0.
91	0.0	0.0	0.
92	0.0	0.0	0.
93	0.0	0.0	0.
94	0.0	0.0	0.
95	0.0	0.0	0.
96	0.0	0.0	0.
97	0.0	0.0	0.
98	0.0	0.0	0.
99	0.0	0.0	0.
100	0.0	0.0	0.
SUM	5.19	4.18	26336.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3365.	366.	263.	263.	26336.
INCHES		4.25	4.25	4.25	4.25
AC-FT		181.	181.	181.	181.

HYDROGRAPH ROUTING

ROUTING THROUGH RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
11	1	0	0	0	0	1

ROUTING DATA

	QLOSS	CLOSS	AVG	IRES	ISAME
	0.0	0.0	0.0		0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	0.

STORAGE=	0.	27.	40.	55.	84.	115.	146.	180.	214.	250.
OUTFLOW=	0.	318.	557.	844.	1830.	4220.	7402.	11204.	15532.	20329.

BY D.J.M. DATE 6-79

CHKD. BY _____ DATE _____

SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

LAKE WALLKILL DAM

SHEET NO. A14 OF

PROJECT 6234

TIME	EOP STOR	AVG IN	EOP OUT
1	0.	0.	0.
2	0.	0.	0.
3	0.	0.	0.
4	0.	0.	0.
5	0.	0.	0.
6	0.	0.	0.
7	0.	0.	0.
8	0.	0.	0.
9	0.	0.	0.
10	0.	0.	0.
11	0.	0.	0.
12	0.	0.	0.
13	0.	0.	0.
14	0.	0.	0.
15	0.	0.	0.
16	0.	0.	0.
17	0.	0.	0.
18	0.	0.	0.
19	0.	0.	0.
20	0.	0.	0.
21	0.	0.	0.
22	0.	21.	2.
23	1.	82.	8.
24	2.	143.	18.
25	3.	179.	31.
26	4.	212.	45.
27	5.	271.	63.
28	7.	379.	87.
29	10.	479.	118.
30	13.	528.	150.
31	15.	551.	181.
32	18.	580.	212.
33	21.	710.	251.
34	26.	968.	307.
35	33.	1367.	427.
36	44.	2171.	638.
37	60.	3046.	999.
38	72.	3047.	1428.
39	78.	2314.	1614.
40	78.	1599.	1611.
41	75.	1127.	1510.
42	70.	848.	1371.
43	66.	683.	1227.
44	62.	607.	1097.
45	59.	552.	983.
46	56.	459.	873.
47	53.	361.	798.
48	49.	296.	736.
49	46.	251.	676.
50	43.	213.	619.
51	40.	179.	564.
52	38.	154.	515.
53	35.	142.	471.
54	33.	137.	431.
55	31.	135.	396.
56	30.	134.	365.
57	28.	127.	336.
58	27.	108.	312.
59	25.	89.	295.
60	24.	79.	278.

61	22.	75.	262.
62	21.	73.	247.
63	20.	72.	234.
64	19.	72.	221.
65	18.	72.	210.
66	17.	72.	199.
67	16.	72.	189.
68	15.	72.	180.
69	15.	72.	171.
70	14.	72.	164.
71	13.	72.	157.
72	13.	72.	150.
73	12.	64.	143.
74	11.	42.	135.
75	11.	20.	126.
76	10.	9.	117.
77	9.	4.	108.
78	8.	1.	100.
79	8.	0.	92.
80	7.	0.	85.
81	7.	0.	78.
82	6.	0.	72.
83	6.	0.	67.
84	5.	0.	61.
85	5.	0.	57.
86	4.	0.	52.
87	4.	0.	48.
88	4.	0.	44.
89	3.	0.	41.
90	3.	0.	38.
91	3.	0.	35.
92	3.	0.	32.
93	3.	0.	30.
94	2.	0.	27.
95	2.	0.	25.
96	2.	0.	23.
97	2.	0.	21.
98	2.	0.	20.
99	2.	0.	18.
100	1.	0.	17.
SUM			26138.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1614.	362.	261.	261.	26138.
INCHES		4.20	4.22	4.22	4.22
AC-FT		179.	180.	180.	180.

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RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	3365.	366.	263.	263.	0.80
ROUTED TO	11	1614.	362.	261.	261.	0.80